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Dividends From Wood Research

Recent Publications
July-December 1996

Explanation and Instructions

"Dividends From Wood Research" is a semiannual listing of recent publications resulting from wood utilization research at the Forest Products Laboratory (FPL). These publications are produced to encourage and facilitate application of Forest Service research. This issue lists publications received from the printer between July 1 and December 31, 1996.

Each publication listed in this brochure is available through at least one of the following sources.

Available from FPL (indicated by an order number before the title of the publication): Quantities limited. Circle the order number on the blank at the end of the brochure and mail or FAX the blank to FPL.

Available through the Internet: Listed publications are available as PDF documents for viewing or printing from FPL's web site (<http://www.fpl.fs.fed.us/>).

Available through sales outlets (indicated by the name of the outlet and, when available, price information): Major sales outlets are the Superintendent of Documents, the National Technical Information Service (NTIS), and various private publishers. Order directly from the outlet.

Available through libraries: Research publications are available through many public and university libraries in the United States and elsewhere. U.S. Government publications are also available through many Government Depository Libraries. Check with a major library near you to determine availability.

List of Categories

Publications are listed in this brochure within the following general categories:

- Biodiversity and Biosystematics of Fungi
- Decay Processes and Bioprocessing
- Durability
- General
- Papermaking and Recycling
- Properties and Use of Wood, Composites, and Fiber Products
- Surface Chemistry
- Timber & Fiber Demand and Technology Assessment
- Wood Anatomy and Identification
- Wood Chemistry

Biodiversity and Biosystematics of Fungi

Armillaria Species of the Olympic Peninsula of Washington State, Including Confirmation of North American Biological Species XI

Banik, Mark T.; Volk, Thomas J.; Burdsall, Harold H., Jr.
1996. *Mycologia*. 88(3): 492-496.

Identificaiton of *Armillaria* Species From Wisconsin and Adjacent Areas

Banik, Mark T.; Paul, Jennifer A.; Burdsall, Harold H., Jr.
1995. *Mycologia*. 87(5): 707-712.

Endophytic Fungi of *Manilkara bidentata* Leaves in Puerto Rico

Lodge, D. Jean; Fisher, P.J.; Sutton, B.C.
1996. *Mycologia*. 88(5): 733-738.

Diversity of Lignicolous Basidiomycetes in Coarse Woody Debris

Nakasone, Karen K.
1996. In: McMinn, James W.; Crossley, D.A. Jr. eds. Biodiversity and coarse woody debris in southern forests. Proceedings of workshop on coarse woody debris in southern forests: effects on biodiversity; 1993 October 18-20; Athens, GA. Gen. Tech. Rep. SE-94. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 35-42.

Morphological and Molecular Studies on *Auriculariopsis albomellea* and *Phlebia albida* and a Reassessment of *A. ampla*

Nakasone, Karen K.
1996. *Mycologia*. 88(5): 762-775.

Armillaria nabsnona, a New Species From Western North America

Volk, Thomas J.; Burdsall, Harold H., Jr.; Banik, Mark T.
1996. *Mycologia*. 88(3): 484-491.

Decay Processes and Bioprocessing

Proceedings of the International Research Group on Wood Preservation; 27th annual meeting; 1996 May 19–24; Guadeloupe, French West Indies. The Research Group on Wood Preservation.

Available from IRG Secretariat, Box 5607, S-114 86 Stockholm, Sweden. Cost: about 150 Swedish crowns/item.

Detection of Brown-Rot Antigens in Southern Pine by Clausen, Carol A. Document IRG/WP 96–20090.

Ibuprofen Inhibits *in vitro* Growth of Brown-Rot Fungi by Clausen, Carol A. Document IRG/WP 96–10160.

Inhibition of Wood Decay and Termite Damage by Calcium Precipitation by Green, Frederick, III; Kuster, T.A.; Ferge, Les; Highley, Terry L. IRG/WP 96–30111.

Distribution of Boron From Fused Borate Rods in Douglas-fir Transmission Poles by Highley, T.L.; Green, Frederick, III; Finney, William F. IRG/WP 96–30112.

Antagonistic Properties of *Gliocladium virens* Against Wood Attacking Fungi by Highley, Terry L.; Padmanabha, H.S. Anantha; Howell, C.R. IRG/WP 96–10162.

Fungal Degradation of Wood Treated With Metal-Based Preservatives—1. Fungal Tolerance by Illman, Barbara L.; Highley, Terry L. IRG/WP 96–10163.

Fungal Degradation of Wood Treated With Metal-Based Preservatives—2. Redox States of Chromium by Illman, Barbara L.; Bajt, Sasa; Highley, Terry L. IRG/WP 96–10164.

Redox Regulation of Enzyme Activity During Wood Decay by Kersten, Philip J.; Kurek, Bernard; Whittaker, James W. IRG/WP 96–10172.

Biopulping: An Overview of Consortia Research

Akhtar, M.; Kirk, T.K.; Blanchette, R.A. 1996. Srebotnik, Ewald; Messner, Kurt, eds. Biotechnology in the pulp and paper industry—recent advances in applied and fundamental research: Proceedings of the 6th international conference on biotechnology in the pulp and paper industry; Vienna, Austria: Facultas-Universitätsverlag: 187–192.

An Improvement in *Pichia stipitis* Fermentation of Acid-Hydrolysed Hemicellulose Achieved by Overliming (Calcium Hydroxide Treatment) and Strain Adaptation

Amartey, S.; Jeffries, T. 1996. World J. Microb. & Biotech. 12: 281–283.

Polycyclic Aromatic Hydrocarbon-Degrading Capabilities of *Phanerochaete laevis* HHB-1625 and Its Extracellular Ligninolytic Enzymes

Bogan, Bill W.; Lamar, Richard T. 1996. Appl. Environ. Microbiol. 62(5): 1597–1603.

Fluorene Oxidation In Vivo by *Phanerochaete chrysosporium* and In Vitro During Manganese Peroxidase-Dependent Lipid Peroxidation

Bogan, Bill W.; Lamar, Richard T.; Hammel, Kenneth 1996. App. Environ. Microbiol. 62(5): 1788–1792. **Expression of *Lip* Genes During Growth in Soil and Oxidation of Anthracene by *Phanerochaete chrysosporium***

Bogan, Bill W.; Schoenike, Barry; Lamar, Richard T.; Cullen, Dan 1996. Appl. Environ. Microbiol. 62(10): 3697–3703.

Manganese Peroxidase mRNA and Enzyme Activity Levels During Bioremediation of Polycyclic Aromatic Hydrocarbon-Contaminated Soil With *Phanerochaete chrysosporium*

Bogan, Bill W.; Schoenike, Barry; Lamar, Richard T.; Cullen, Dan 1996. Appl. Environ. Microbiol. 62(7): 2381–2386.

Biobleaching in Dissolving Pulp Production

Christov, L.P.; Akhtar, M.; Prior, B.A. 1996. Srebotnik, Ewald; Messner, Kurt, eds. Biotechnology in the pulp and paper industry—recent advances in applied and fundamental research: Proceedings of the 6th international conference on biotechnology in the pulp and paper industry; 1995, June 11–15; Vienna, Austria. Vienna, Austria: Facultas-Universitätsverlag: 625–628.

Bacterial Associations With Decaying Wood: A Review

Clausen, Carol A. 1996. Int. Biodeter. Biodegrad. 37(Jan/Mar): 101–107.

Characterization of Polygalacturonase From the Brown-rot Fungus *Postia placenta*

Clausen, C.A.; Green, F., III. 1996. Appl. Microbiol. Biotechnol. 45: 750–754.

Fungal Removal of Wood Sapstain Caused by *Ceratocystis coerulea*

Croan, Suki C.; Highley, Terry L. 1996. Mater. Org. 30: 45–56.

Enzymology and Molecular Biology of Lignin Degradation

Cullen, D.; Kersten, P.J. 1996. In: Esser, K.; Lemke, P.A. eds. The Mycota—A comprehensive treatise of fungi as experimental systems for basic and applied research. Brambl, R.; Marzluf, G.A., eds. Vol. III Biochemistry and molecular biology. New York, NY: Springer-Verlag Berlin Heidelberg: 295–312.

Mechanism of *Steptomyces xylanases* in the Prebleaching of Kraft Pulp

Elegir, G.; Sykes, M.; Jeffries, T.W. 1996. In: Srebotnik, Ewald; Messner, Kurt, eds. Biotechnology in the pulp and paper industry: recent advances in applied and fundamental research. Proceedings of 6th international conference on biotechnology in the pulp and paper industry: advances in applied and fundamental research. Vienna, Austria: Facultas-Universitätsverlag: 87–92.

Pitch Reduction With the White-Rot Fungus *Ceriporiopsis subvermispora*

Fischer, K.; Akhtar, M.; Messner, K.; Blanchette, R.A.; Kirk, T.K.

1996. In: Srebotnik, Ewald; Messner, Kurt, eds. Biotechnology in the pulp and paper industry: recent advances in applied and fundamental research. Proceedings of 6th international conference on biotechnology in the pulp and paper industry: advances in applied and fundamental research. Vienna, Austria: Facultas-Universitätsverlag: 193–198.

Enhanced Removal of Toners From Office Waste Papers by Microbial Cellulases

Jeffries, T.W.; Sykes, M.S.; Rutledge–Cropsey, K.; Klunness, J.H.; Abubakr, S.

1996. In: Srebotnik, Ewald; Messner, Kurt, eds. Biotechnology in the pulp and paper industry: recent advances in applied and fundamental research. Proceedings of 6th international conference on biotechnology in the pulp and paper industry: advances in applied and fundamental research. Vienna, Austria: Facultas-Universitätsverlag: 141–144.

Manganese-Dependent Cleavage of Nonphenolic Lignin Structures by *Ceriporiopsis subvermispora* in the Absence of Lignin Peroxidase

Jensen, Kenneth A., Jr.; Bao, Wuli; Kawai, Shingo; Srebotnik, Ewald; Hammel, Kenneth E.

1996. Appl. Environ. Microbiol. 62(10): 3679–3686.

Detection and Quantification of Oxalic Acid From the Brown-Rot Decay Fungus, *Postia placenta*

Jordan, C.R.; Dashek, W.V.; Highley, T.L.

1996. Holzforschung. 50(4): 312–318.

Electron Microscopic Systems Imaging of C, P and Fe Localizations in the Brown-Rot Fungus, *Postia placenta*

Jordan, C.R.; Dashek, W.V.; Highley, T.L.

1996. Holzforschung. 50(4): 319–326.

Detection and Quantification of Oxalic Acid From the Brown-Rot Decay Fungus, *Postia placenta*

Jordan, C.R.; Dashek, W.V.; Highley, T.L.

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Electron Microscopic Systems Imaging of C, P and Fe Localizations in the Brown-Rot Fungus, *Postia placenta*

Jordan, C.R.; Dashek, W.V.; Highley, T.L.

1996. Holzforschung. 50(4): 319–326.

Technical Overview of Forest Biotechnology Research in the U.S.

Kirk, T.K.

1996. In: Srebotnik, Ewald; Messner, Kurt, eds. Biotechnology in the pulp and paper industry: recent advances in applied and fundamental research. Proceedings of 6th international conference on biotechnology in the pulp and paper industry: advances in applied and fundamental research. Vienna, Austria: Facultas-Universitätsverlag: 3–8.

The Cellulases Endoglucanase I and Cellobiohydrolase II of *Trichoderma reesei* Act Synergistically to Solubilize Native Cotton Cellulose but not to Decrease Its Molecular Size

Kleman–Leyer, Karen M.; Siika–Aho, Matti; Teeri, Tuula T.; Kirk, Kent T.

1996. Appl. Environ. Microbiol. 62(8): 2883–2887.

Development of Fungal Inocula for Bioaugmentation of Contaminated Soils

Lestan, Domen; Lamar, Richard T.

1996. Appl. Environ. Microbiol. 62(6): 2045–2052.

Development of an Oligonucleotide Probe for *Aureobasidium pullulans* Based on the Small-Subunit rRNA Gene

Li, Shuxian; Cullen, Daniel; Hjort, Mary; Spear, Russell; Andrews, John H.

1996. Appl. Environ. Microbiol. 62(5): 1514–1518.

In vitro Oxalic Acid Production by the Brown-Rot Fungus *Postia placenta*

Micales, Jessie A.

1995. Mater. und Organ. 29(3): 159–176.

Oxalate Decarboxylase in the Brown-Rot Wood Decay Fungus *Postia Placenta*

Micales, Jessie A.

1995. Mater. und Organ. 29(3): 178–186.

Isozymes: Methods and Applications

Micales, J.A.; Bonde, M.R.

1995. In: Singh, Rudra P.; Singh, Uma S., eds. Molecular methods in plant pathology. Boca Raton, FL: CRC Press, Inc.: 115–130.

lip-Like Genes in *Phanerochaete sordida* and *Ceriporiopsis subvermispora*, White Rot Fungi With No Detectable Lignin Peroxidase Activity

Rajakumar, Suseela; Gaskell, Jill; Cullen, Daniel; Lobos, Sergio; Karahanian, Eduardo; Vicuna, Rafael

1996. Appl. Environ. Microbiol. 62(7): 2660–2663.

Polymerization of Pentachlorophenol and Ferulic Acid by Fungal Extracellular Lignin-Degrading Enzymes

Ruttimann–Johnson; Carmen; Lamar, Richard T.

1996. Appl. Environ. Microbiol. 62(10): 3890–3893.

Biomechanical Pulping of Kenaf

Sabharwal, Harmohinder S.; Akhtar, Masood; Blanchette, Robert A.; Young, Raymond A.

1994. Tappi J. 77(12): 105–112.

Development of Biological Pulping Processes for Non-Woody Plants

Sabharwal, H.S.; Akhtar, M.; Yu, E.; Agostino, D.D.; Young, R.A.; Blanchette, R.A.

1996. Srebotnik, Ewald; Messner, Kurt, eds. Biotechnology in the pulp and paper industry—recent advances in applied and fundamental research: Proceedings of the 6th international conference on biotechnology in the pulp and paper industry; 1995, June 11–15; Vienna, Austria. Vienna, Austria: Facultas-Universitätsverlag: 233–236.

Biosulfite Pulping Using *Ceriporiopsis subvermispora*

Scott, G.M.; Akhtar, M.; Lentz, M.; Sykes, M.; Abubakr 1996. 1996. Srebotnik, Ewald; Messner, Kurt, eds. Biotechnology in the pulp and paper industry—recent advances in applied and fundamental research: Proceedings of the 6th international conference on biotechnology in the pulp and paper industry; 1995, June 11–15; Vienna, Austria. Vienna, Austria: Facultas-Universitätsverlag: 217–220.

A Variable-Tilt Fermentation Rack for Screening Organisms in Microfuge Tubes

Sreenath, Hassan K.; Jeffries, Thomas W. 1996. Biotechnol. Tech. 10(4): 239–242.

Enzymatic Polishing of Jute/Cotton Blended Fabrics

Sreenath, Hassan K.; Shah, Arun B.; Yang, Vina W.; Gharia, Mahendra M.; Jeffries, Thomas W. 1996. J. Fernen. & Bioeng. 81(1): 18–20.

Toner Removal by Alkaline-Active Cellulases From Desert Basidiomycetes

Sreenath, Hassan K.; Yang, Vina W.; Burdsall, Harold H., Jr.; Jeffries, Thomas W. 1996. In: Jeffries, Thomas W.; Viikari, Liisa, eds. Enzymes for pulp and paper processing. ACS Symposium Series 655. Proceedings, 211th ACS national meeting; 1996, March 24–28; New Orleans, LA. Washington, DC: American Chemical Society: 267–279. Chap. 21.

Flakeboards From Recycled CCA-Treated Southern Pine Lumber

Vick, Charles B.; Geimer, Robert L.; Wood, James E., Jr. 1996. Forest Prod. J. 46(11/12): 89–91.

Durability

Stress Wave Nondestructive Evaluation of Green Veneer: Southern Yellow Pine and Douglas Fir

Brashaw, Brian K.; Ross, Robert J.; Pellerin, Roy F. 1996. In: Doctor, Steve; Lebowitz, Carol A.; Baaklini, George Y., eds. Nondestructive evaluation of materials and composites. Proceedings of symposium; 1996, December 3–5; Scottsdale, AZ. Bellingham, WA: SPIE The International Society for Optical Engineering; Vol. 2944: 296–306.

Accuracy of Wood Resistance Sensors for Measurement of Humidity

Carll, Charles; TenWolde, Anton 1996. J. Testing and Eval. 24(3): 154–160.

Fire Endurance Modeling of Wood Structural Systems

Cramer, Steven M.; White, Robert H. 1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28–31; New Orleans, LA. Baton Rouge, LA: Louisiana State University; Vol. 2: 249–256.

A Laboratory Soil-Contact Decay Test: An Accelerated Method to Determine Durability of Treated Wood Shakes

De Groot, Rodney C.; Woodward, Bessie 1996. Wood Fiber Sci. 28(2): 214–226.

Ignitability Analysis of Siding Materials Using Modified Protocol for Lift Apparatus

Dietenberger, Mark A. 1996. Fire. Mater. 20: 115–121.

The Recycling Potential of Preservative-Treated Wood

Felton, Colin C.; DeGroot, Rodney C. 1996. Forest Prod. J. 46(7/8): 37–46.

Fundamental Thermophysical Properties of Materials Derived From the Cone Calorimeter Measurements

Grexa, Ondrej; Janssens, Marc; White, Robert; Dietenberger, Mark 1996. In: Wood & Fire Safety. Proceedings, 3rd international scientific conference; 1996, May 6–9; Slovak Republic. Zvolen, Slovak Republic: Technical University Zvolen, Faculty of Wood Technology: 139–147.

A Miniature Mechanical Apparatus and Test Protocol for Bending and Crushing Tests in Wood Preservation Research

Gui, Young Q.; Nicholas, Darrel D.; Crawford, Douglas. 1996. Forest Prod. J. 46(10): 77–80.

1. Leaching of Wood Preservative Components and Their Mobility in the Environment—Summary of Pertinent Literature

Lebow, Stan. 1996. USDA Forest Serv. Gen. Tech. Rep. FPL–GTR–93. 36 p.

Preservative-treated wood is an economical, durable, and aesthetically pleasing building material; therefore, it is a natural choice for construction projects in our National Forests, National Parks, and other public lands. However, we need to ensure that the chemicals used in treated wood do not pose a threat to people or the environment. The purpose of this report is to provide a summary of the pertinent literature on leaching of wood preservative components and their mobility in the environment.

Energy Criterion for Fatigue Strength of Wood Structural Members

Liu, Jen Y.; Ross, Robert J. 1996. J. Eng. Mater. Tech. 118: 375–378.

Improved Arcan Shear Test for Wood

Liu, Jen Y.; Ross, Robert J.; Rammer, Douglas 1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28–31; New Orleans, LA. Baton Rouge, LA: Louisiana State University; Vol. 2: 85–90.

Nondestructive Evaluation of Timber Bridges

Pellerin, Roy F.; Lavinder, Jeff A.; Ross, Robert J.; Falk, Robert H.
1996. *In*: Doctor, Steve; Lebowitz, Carol A.; Baaklini, George Y., eds. Nondestructive evaluation of materials and composites. Proceedings of symposium; 1996, December 3–5; Scottsdale, AZ. Bellingham, WA: SPIE The International Society for Optical Engineering; Vol. 2944: 275–284.

Fasteners as Damage Indicators in Timber Structures

Pollock, David G.; Bender, Donald A.; Soltis, Lawrence A.
1996. *In*: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28–31; New Orleans, LA. Baton Rouge, LA: Louisiana State University; Vol. 2: 96–103.

Recent Research on the Shear Strength of Wood Beams

Rammer, Douglas R.; McLean, David I.
1996. *In*: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28–31; New Orleans, LA. Baton Rouge, LA: Louisiana State University; Vol. 1: 283–290.

NDE of Historic Structures—USS Constitution

Ross, Robert J.; McDonald, Kent A.; Soltis, Lawrence A.
1996. *In*: Doctor, Steve; Lebowitz, Carol A.; Baaklini, George Y., eds. Nondestructive evaluation of materials and composites. Proceedings of symposium; 1996, December 3–5; Scottsdale, AZ. Bellingham, WA: SPIE The International Society for Optical Engineering; Vol. 2944: 266–274.

Stress Wave NDE of Biologically Degraded Wood

Ross, Robert J.; DeGroot, Rodney C.; Nelson, William J.; Lebow, Patricia K.; Pellerin Roy F.
1996. *In*: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28–31; New Orleans, LA. Baton Rouge, LA: Louisiana State University; Vol. 3: 213–217.

Ultrasonic Defect Detection in Wooden Pallet Parts for Quality Sorting

Schmoldt, Daniel L.; Nelson, Robert M.; Ross, Robert J.
1996. *In*: Doctor, Steve; Lebowitz, Carol A.; Baaklini, George Y., eds. Nondestructive evaluation of materials and composites. Proceedings of symposium; 1996, December 3–5; Scottsdale, AZ. Bellingham, WA: SPIE The International Society for Optical Engineering; Vol. 2944: 285–295.

Tensile Strength of Fire-Exposed Wood Members

White, Robert H.
1996. *In*: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28–31; New Orleans, LA. Baton Rouge, LA: Louisiana State University; Vol. 2: 385–390.

Charring Rate of Wood Exposed to a Constant Heat Flux

White, Robert H.; Tran, Hao C.
1996. *In*: Wood & Fire Safety. Proceedings, 3rd international scientific conference; 1996, May 6–9; Slovak Republic. Zvolen, Slovak Republic: Technical University Zvolen, Faculty of Wood Technology: 175–183.

Preliminary Evaluation of the Flammability of Native and Ornamental Plants With the Cone Calorimeter

White, Robert H.; Weise, David R.; Frommer, Susan
1996. *In*: Proceedings of 21st international conference on fire safety; 1996 January 8–12; Millbrae, CA. Sissonville, WV: Product Safety Corporation: 257–265.

General

Development of Spanish Language Construction Manual for Wood Frame Housing in Mexico

Moody, Russell; Wershoffen, Manuel Elorza; Davalos-Sotelo, Raymundo; Mathur, Vishwa
1996. *In*: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28–31; New Orleans, LA. Baton Rouge, LA: Louisiana State University; Vol. 4: 541–545.

2. Energy and Minerals Industries in National, Regional, and State Economies

Shields, Deborah, J.; Winter, Susan A.; Alward, Gregory S.; Hartung, Kathy L.
1996. USDA Forest Serv. Gen. Tech. Rep. FPL–GTR–95. 82 p.

This report presents information on the contribution of the extractive industries to the domestic economy at different geopolitical scales. Areas where resource production is important to gross state or regional product, employment, or income are highlighted. Output, employment, value added, and personal and total income multipliers are reported for the energy and mineral sectors.

Papermaking and Recycling

Mechanism of Retention of Metal Cations in Linerboard and Never-Dried Pulps

Abubakr, Said M.; Reichert, Thomas W.; Hrutfiord, Bjorn F.; McKean, William T.
1996. *In*: Proceedings of the 1996 Recycling symposium; 1996 March 3–6; New Orleans, LA. Atlanta, GA: TAPPI PRESS: 43–49.

Chemical and Mechanical Pulping of Aspen Chunkwood, Mature Wood, and Juvenile Wood

Myers, Gary C.; Arola, Rodger A.; Horn, Richard A.; Wegner, Theodore H.
1996. Tappi J. 79(12): 161–168.

Viscoelastic Modeling of Paper

Saliklis, Edmond P.
1996. *In*: Proceedings of 11th conference Engineering Mechanics Division/ASCE; 1996, May 19–22; Fort Lauderdale, FL. New York, NY: American Society of Civil Engineers: 2246–249.

3. Pulpability of Beetle-Killed Spruce

Scott, Gary M.; Bormett, David W.; Sutherland, Nancy Ross; Abubakr, Said; Lowell, Eini
1996. USDA Forest Serv. Res. Pap. FPL-RP-557. 8 p.

Infestation of the *Dendroctonus rufipennis* beetle has resulted in large stands of dead and dying timber on the Kenai Peninsula in Alaska. This paper gives the results of tests conducted to evaluate the value of beetle-killed spruce as pulpwood.

Bleachability of Recycled Fibers Deinked With Enzyme Preparations

Sykes, Marguerite; Klungness John; Abubakr, Said; Tan, Frey
1996. In: Proceedings of the 1996 Recycling symposium; 1996 March 3-6; New Orleans, LA. Atlanta, GA: TAPPI PRESS: 63-67.

Review of Buckling Mode and Geometry Effects on Postbuckling Strength of Corrugated Containers

Urbanik, Thomas J.
1996. In: Sammataro, Robert F.; Ammerman, Douglas J., eds. Development, validation, and application of inelastic methods for structural analysis and design. Proceedings of the ASME international mechanical engineering congress and exposition; 1996, November 17-22; Atlanta, GA. New York, NY: The American Society of Mechanical Engineers: 85-94.

The Influence of Water on the Elastic Modulus of Paper

Zauscher, Stefan; Caulfield, Daniel F.; Nissan, Alfred H.
1996. Tappi J. 79(12): 178-182.

Properties and Use of Wood, Composites, and Fiber Products

Effects of Two Fiber Treatments on Properties of Hemlock Hardboard

Chow, Poo; Bao Zhaozhen; Youngquist, John A.; Rowell, Roger M.; Muehl, James H.; Krzysik, Andrzej M.
1996. Forest Prod. J. 46(7/8): 62-66.

Properties of Hardboards Made From Acetylated Aspen and Southern Pine

Chow, Poo; Bao, Zhaozhen; Youngquist, John A.; Rowell, Roger M.; Muehl, James H.; Krzysik, Andrzej M.
1996. Wood Fiber Sci. 28(2): 252-258.

Fracture Modeling of Lumber Containing Multiple Knots

Cramer, Steven; Shi, Yupu; McDonald, Kent
1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28-31; New Orleans, LA. Baton Rouge, LA: Louisiana State University: Vol. 4: 288-294.

System Stiffness for Stress-Laminated Timber Bridge Decks

Davalos, Julio F.; Sonti, Sharma S.; Shaik, Sattar; Moody, Russell C.; Hernandez, Roland
1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28-31; New Orleans, LA. Baton Rouge, LA: Louisiana State University: Vol. 1: 213-220.

Geotextiles—A Specific Application of Biofibers

English, Brent
1995. In: Olesen, Ole; Rexen, Finn; Larsen, Jorgen, eds. Research in industrial applicaiton of non food crops—I. plant fibres: Proceedings of a seminar; 1995 May; Copenhagen, Denmark. Lyngby, Denmark: Acad. Tech. Sci.: 79-86.

Property Relationships for Tropical Hardwoods

Green, David W.; Rosales, Augusto
1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28-31; New Orleans, LA. Baton Rouge, LA: Louisiana State University: Vol. 3: 516-521.

Mechanical Stress Grading of Dahurian Larch Structural Lumber

Gupta, Rakesh; Ethington Robert L.; Green, David W.
1996. Forest Prod. J. 46(7/8): 79-86.

Analysis of Glulam Timber Beams With Mechanically Graded (E-Rated) Outer Laminations

Hernandez, Roland; Moody, Russell C.
1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28-31; New Orleans, LA. Baton Rouge, LA: Louisiana State University: Vol. 1: 144-150.

4. Field Performance of Timber Bridges—7. Connell Lake Stress-Laminated Deck Bridge

Hislop, Lola E.; Ritter, Michael A.
1996. USDA Forest Serv. Res. Pap. FPL-RP-550. 13 p.

The Connell Lake bridge was constructed in early 1991 on the Tongass National Forest, Alaska, as a demonstration bridge under the Timber Bridge Initiative. The bridge is a stress-laminated deck structure with an approximate 36-ft length and 18-ft width and is the first known stress-laminated timber bridge constructed in Alaska. Performance of the bridge was monitored for 2-1/2 years, beginning at bridge construction. Based on 2-1/2 years of field evaluations, the deck is performing well with no structural deficiencies. However, a slight sag has developed at midspan and several stressing bar bearing plates have crushed into the outside deck laminations.

5. Field Performance of Timber Bridges—9. Big Erick's Stress-Laminated Deck Bridge

Kainz, James A.; Wacker, James P.; Nelson, Martin
1996. Forest Serv. Res. Pap. FPL-RP-552. 24 p.

The Big Erick's bridge was constructed during September 1992 in Baraga County, Michigan. The bridge is 72 ft long, 16 ft wide, and consists of three simple spans: two stress-laminated deck approach spans and a stress-laminated box center span. The bridge is unique in that it is one of the first known stress-laminated timber bridge applications to use Eastern Hemlock sawn lumber and a combination of stress-laminated decks and a stress-laminated box in a single bridge. Performance of the bridge was monitored for 35 months, beginning at the time of installation. Based on field evaluations, the bridge is performing well, with only minor serviceability deficiencies.

Vacuum-Pressure Soak Plus Ovendry as an Accelerated-Aging Test for Wood-Based Panel Products

Karlsson, Per O.A.; McNatt, J. Dobbin; Verrill, Steve P.
1996. Forest Prod. J. 46(9): 84-88.

Injection Molding of Polypropylene Reinforced With Short Jute Fibers

Karmaker, A.C.; Youngquist, J.A.
1996. J. Appl. Poly. Sci. 62: 1147-1151.

Modeling Moisture Content-Mechanical Property Relationships for Clear Southern Pine

Kretschmann, David E.; Green, David W.
1996. Wood Fiber Sci. 28(3): 320-337.

Moisture Content-Specific Gravity Relationships for Clear Southern Pine

Kretschmann, David E.; Green, David W.
1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28-31; New Orleans, LA. Baton Rouge, LA: Louisiana State University: Vol. 2: 536-542.

6. Field Performance of Timber Bridges—10. Sanborn Brook Stress-Laminated Deck Bridge

Lee, Paula D. Hilbrich; Ritter, Michael A.; Wacker, James P.
1996. USDA Forest Serv., Res. Pap. FPL-RP-555. 19 p.

The Sanborn Brook bridge was constructed in August 1991, 10 miles northeast of Concord, New Hampshire, as part of the demonstration timber bridge program of the USDA Forest Service. The bridge is a simple-span, double-lane, stress-laminated deck superstructure constructed from Southern Pine lumber and is approximately 25 ft long and 28 ft wide with a skew of 14 degrees. The performance of the bridge was monitored continuously for approximately 2 years, beginning shortly after installation. Based on field evaluations, the bridge is performing well, with no structural or serviceability deficiencies.

Efficient Hardwood Glued-Laminated Beams

Manbeck, Harvey B.; Janowiak, John J.; Blankenhorn, Paul R.; Labosky, Peter, Jr.; Moody, Russell C.; Hernandez, Roland
1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28-31; New Orleans, LA. Baton Rouge, LA: Louisiana State University: Vol. 1: 283-290.

Hardwood Structural Lumber From Log Heart Cants

McDonald, Kent A.; Hassler, Curt C.; Hawkins, Jack E.; Pahl, Timothy L.
1996. Forest Prod. J. 46(6): 55-62.

7. Experimental Shear Strength of Unchecked Solid-Sawn Douglas-fir

Rammer, Douglas R.; Soltis, Lawrence A.; Lebow, Patricia K.
1996. USDA Forest Serv. Res. Pap. FPL-RP-553. 33 p.

This report presents experimental results of modulus of rupture and shear strength tests on unsplit, green, sawn Douglas-fir lumber. Five different size-matched specimens, ranging from nominal 2- by 4-in. (standard 38- by 89-mm) to nominal 4- by 14-in. (standard 95- by 343-mm), were tested in third-point bending and five-point beam shear. A total of 120 bending and 160 shear specimens, as well as shear blocks cut from each beam, were tested. Results adjusted to 12 percent moisture content are compared with results from prior research on Douglas-fir glued-laminated timber beams.

Recommended Construction Practices for Stress-Laminated Wood Bridge Decks

Ritter, Michael A.; Lee, Paula D. Hilbrich
1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28-31; New Orleans, LA. Baton Rouge, LA: Louisiana State University: Vol. 1: 237-244.

8. Field Performance of Timber Bridges—6. Hoffman Run Stress-Laminated Deck Bridge

Ritter, Michael A.; Lee, Paula D. Hilbrich; Porter, Gregory J.
1996. Forest Serv. Res. Pap. FPL-RP-549. 16 p.

The Hoffman Run bridge, located just outside Dahaga, Pennsylvania, was constructed in October 1990. The bridge is a simple-span, single-lane, stress-laminated deck superstructure that is approximately 26 ft long and 16 ft wide. It is the second stress-laminated timber bridge to be constructed on hardwood lumber in Pennsylvania. The performance of the bridge was monitored continually for approximately 32 months, beginning shortly after installation. Based on field evaluations, the bridge is performing properly with no structural deficiencies, although with respect to serviceability, the bridge has developed a slight sag at midspan.

9. National Conference on Wood Transportation Structures

Ritter, Michael A.; Duwardi, Shella Rimal;
Lee, Paula D. Hilbrich, eds.
1996. USDA Forest Serv. Gen. Tech. Rep. FPL-GTR-94. 494 p.

The Federal Highway Administration and the USDA Forest Service, Forest Products Laboratory, jointly sponsored the National Conference on Wood Transportation Structures, October 23-25, 1996, in Madison, Wisconsin. This was a direct result of 5 years of cooperation in conducting research related to timber transportation structures. The objective of the conference was to present state-of-the-art information on wood utilization in transportation applications. The conference included a plenary session, reviewing timber bridges throughout the world, followed by concurrent paper sessions on various topics. This report includes the papers presented at this conference.

Summary of U.S. Research on Wood Transportation Structures

Ritter, Michael A.; Moody, Russell; Duwadi, Sheila Rimal
1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28–31; New Orleans, LA. Baton Rouge, LA: Louisiana State University. Vol. 1: 81–88.

Chemical Modification of Agricultural Fibers for Property Enhanced Composites

Rowell, Roger M.
1995. In: Olesen, Ole; Rexen, Finn; Larsen, Jorgen, eds. Research in industrial application of nonfood crops—1. plant fibres: Proceedings of a seminar; 1995 May; Copenhagen, Denmark. Lyngby, Denmark: Academy of Technical Sciences: 49–70.

Composite Materials From Agricultural Resources

Rowell, Roger M.
In: Olesen, Ole; Rexen, Finn; Larsen, Jorgen, eds. Research in industrial application of nonfood crops—1. plant fibres: Proceedings of a seminar; 1995 May; Copenhagen, Denmark. Lyngby, Denmark: Academy of Technical Sciences: 27–41.

A New Generation of Composite Materials From Agro-Based Fiber

Rowell, Roger M.
1995. In: Prasad, Paraas N., Mark, James E., I Fai, Ting Joo, eds. Polymers and other advanced materials: emerging technologies and business opportunities: Proceedings of 3rd international conference on frontiers of polymers and advanced materials; 1995, January 16–20; Kuala Lumpur, Malaysia. New York, NY: Plenum Press: 659–665.

Behavior of Metal-Plate-Connected Trusses With Square-End Webs

Stahl, Douglas C.; Cramer, Steven M.; Wolfe, Ronald W.
1996. Forest Prod. J. 36(6): 78–84.

Portable Glulam Timber Bridge Systems

Taylor, Steven E.; Ritter, Michael A.; Keliher, Keith P.; Thompson, Jason D.
1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28–31; New Orleans, LA. Baton Rouge, LA: Louisiana State University. Vol. 2: 368–375.

10. Predictor Sort Sampling, Tight t's, and the Analysis of Covariance: Theory, Tables, and Examples

Verrill, Steve P.; Green, David W.
1996. USDA Forest Serv. Res. Pap. FPL–RP–558. 105 p.

In recent years, wood strength researchers have begun to replace experimental unit allocation by random sampling with allocation by sorts based on nondestructive measurements of strength predictors, such as modulus of elasticity and specific gravity. Although this procedure has the potential of greatly increasing experimental sensitivity, as currently implemented it can easily reduce sensitivity. In this paper, the problem and solutions are presented. Given the existence of nondestructive measurements of strength predictors, these methods can be used to reduce sample sizes. A public domain computer program has been written that implements the methods.

11. Field Performance of Timber Bridges—8. Lynches Wood Park Stress-Laminated Deck Bridge

Wacker, James P.; Ritter, Michael A.; Conger, Don
1996. USDA Forest Serv. Res. Pap. FPL–RP–551. 17 p.

The Lynches Woods Park bridge was constructed during the summer of 1990 in Newberry, South Carolina. It is a single-span, single-lane stress-laminated deck superstructure that measures approximately 30 ft long, 16 ft wide, and 14 in. deep. The bridge is unique in that it is one of the first known stress-laminated deck bridges to be constructed of Southern Pine lumber treated with chromated copper arsenate. The performance of the bridge was continuously monitored for approximately 3 years, beginning 10 months after installation. Based on the field evaluations, the bridge is performing well with no structural or serviceability deficiencies.

Threaded-Nail Fasteners—Research and Standardization Needs

Wills, B.L.; Winistorfer, S.G.; Bender, D.A.; Pollock, D.G.
1996. Trans. Am. Soc. Agric. Eng. 39(2): 661–668.

Treatment–Processing Effects Model for WBP-Treated Lumber

Winandy, Jerrold E.
1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28–31; New Orleans, LA. Baton Rouge, LA: Louisiana State University. Vol. 3: 125–133.

Structural Performance of Light-Frame Truss—Roof Assemblies

Wolfe, Ronald
1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28–31; New Orleans, LA. Baton Rouge, LA: Louisiana State University. Vol. 3: 263–268.

Assessment of Cement-Bonded Wood Composites as Means of Using Low-Valued Wood for Engineered Applications

Wolfe, Ronald; Gjinolli, Agron E.
1996. In: Gopu, Vijaya K.A., ed. Proceedings of the international wood engineering conference; 1996, October 28–31; New Orleans, LA. Baton Rouge, LA: Louisiana State University. Vol. 3: 74–81.

Surface Chemistry

Critical Variables in the Rapid Cure and Bonding of Phenolic Resins

Geimer, Robert L.; Christiansen, Alfred W.
1996. Forest Prod. J. 46(11/12): 67–72.

Field Study on the Effect of Acidic Conditions on the Adhesion of Paint to Western Redcedar

Knaebe, Mark T.; Williams, R. Sam; Spence, John W.
1996. J. Coatings Technol. 68(856): 27–30.

Fortified Mangrove Tannin-Based Plywood Adhesive

Sowunmi, S.; Eberwele, R.O.; Conner, A.H.; River, B. H.
1996. *J. Appl. Poly. Sci.* 62: 577-584.

Phenol-Formaldehyde Resin Curing and Bonding Under Dynamic Conditions

Wang, X. -M.; Riedl, B.; Geimer, R.L.; Christiansen, A.W.
1996. *Wood Sci. Technol.* 30: 423-442.

Timber & Fiber Demand and Technology Assessment

Potential Impacts of Source Reduction Policies on Pulp and Paper Markets in the United States

Durbak, Irene; Marcin, Thomas C.; Ince, Peter J.
1996. *In: Caulfield, Jon P.; Bullard, Steven H., eds. A world of forestry: Proceedings of 25th annual Southern Forest Economics workshop*; 1995 April 17-19; New Orleans, LA. Atlanta, GA: Wachovia Timberland Investment Management: 192-208.

Value of Timber and Agricultural Products in the United States, 1991

McKeever, David B.; Howard, James L.
1996. *Forest Prod. J.* 46(10): 45-50.

Sources and Availability of Recovered Wood and Fiber for Composite Products

McKeever, David B.; Youngquist, John A.; English, Brent W.
1995. *In: Proceedings of 29th international particleboard/composite materials symposium*; 1995 April 4-6; Pullman, WA. Pullman, WA: Washington State University: 197-214.

Emerging Nonwood Building Materials in Residential Construction

Spelter, Henry
1996. *Forest Prod. J.* 46(7/8): 29-36.

A Look at the Road Ahead for Structural Panels

Spelter, Henry; McKeever, Tim
1996. *Crow's J.* 11(5): 22-28.

12. Economic Feasibility of Products From Inland West Small-Diameter Timber

Spelter, Henry; Wang, Rong; Ince, Peter
1996. USDA Forest Serv. Gen. Tech Rep. FPL-GTR-92. 17 p.

A large part of the forests located in the Rocky Mountain region of the U.S. West (inland West) is characterized by densely packed, small-diameter stands. The purpose of this study was to examine the economic feasibility of using small-diameter material from this resource to manufacture various wood products: oriented strandboard, stud lumber, random-length dimension lumber, machine-stress-rated random-length lumber, laminated veneer lumber, and market pulp.

13. The Colville Study: Wood Utilization for Ecosystem Management—Preliminary Results of Study of Product Potential From Small-Diameter Stands

Willits, S.; Basrbour, R.J.; Tesch, S.; Ryland, D.; McNeel, J.; Fight, R.; Kumar, S.; Myers, G.; Olson, B.; Mason A.
1996. USDA Forest Serv., Res. Pap. FPL-RP-559. 11 p.

The Colville Study was developed in 1994 to identify and evaluate a series of management options for achieving ecosystem objectives in dense stands of small-diameter trees while also producing wood products. The Colville National Forest selected the Rocky II Timber Sale as an example of this type of stand that needed management to achieve the following goals: (1) create late successional forest structure, (2) decrease forest health risk from fire, insects, and disease, (3) improve wildlife habitat by providing large green trees and snags, and (4) improve stand aesthetics by decreasing stand density.

Wood Anatomy and Identification

Major Timber Trees of Guyana—Timber Characteristics and Utilization

Gérard, J.; Miller, R.B.; ter Welle, B.J.H.
1996. Tropenbos Series 15, ISSN 1383-6811. ISBN 90-5113-027-9. 224 p.

Available from: Backhuys Publishers, P.O. Box 321, 2300 AH Leiden, The Netherlands. Cost: Dutch Guilders 60,00.

Wood Chemistry

A Proposed Model of the Tracheid Cell Wall of Southern Yellow Pine Having an Inherent Radial Structure in the S₂ Layer

Larsen, Michael J.; Winandy Jerrold E.; Green, Frederick, III.
1995. *Mater. und Organ.* 29(3): 197-210.

New Preparations of Lignin Polymer Models Under Conditions that Approximate Cell Wall Lignification—II. Structural Characterization of the Models by Thioacidolysis

Terashima, N.; Atalla, R.H.; Ralph, S.A.; Landucci, L.L.; Lapiere, C.; Monties, B.
1996. *Holzforschung.* 50(1): 9-14.

Special Item

Finishes for Exterior Wood

Williams R. Sam; Knaebe, Mark T.; Feist, William C.
1996. Madison, WI: Forest Products Society. 127 p.

Available from Forest Products Society; 2801 Marshall Court; Madison, WI 53705-2295. Cost \$19.95.

This manual describes the characteristics of wood finishes and their proper application to solid and composite wood products. It describes how manufacturing and construction practices affect the surfaces of wood products, how various types of finishes interact with the surface, and how weathering affects the wood and finished wood surfaces. Methods for selecting and applying various exterior wood finishes are also presented. Finally, the degradation and discoloration of wood finishes are discussed, and methods are given for preventing these problems.

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